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**Citation for published version:**

Moran, N 2013, 'Music, bodies and relationships: An ethnographic contribution to embodied cognition studies', *Psychology of Music*, vol. 41, no. 1, pp. 5-17. <https://doi.org/10.1177/0305735611400174>

**Digital Object Identifier (DOI):**

[10.1177/0305735611400174](https://doi.org/10.1177/0305735611400174)

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Peer reviewed version

**Published In:**

Psychology of Music

**Publisher Rights Statement:**

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© Moran, N. (2013). Music, bodies and relationships: An ethnographic contribution to embodied cognition studies. *Psychology of Music*, 41(1), 5-17 doi: 10.1177/0305735611400174

**Music, Bodies and Relationships: An ethnographic contribution to embodied cognition studies**

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**Psychology of Music (accepted Dec 2010)**

Keyword: Social interaction, Enactive cognition, Ethnographic, North Indian classical music, Nonverbal communication

Abstract:

This paper sets out the methodology and results of part of an ethnographic study of North Indian music performance, where qualitative interviews were analysed with grounded theory to explore how musicians conceive of musical communication. The findings highlight the importance of socially-responsive movement cues that musicians use to co-ordinate their participation in musical events. Effective musical communication, as explored in this paper, is seen to depend on the manifestation and maintenance of the relationships between participants. This analytical attention to the moment-by-moment processes of interaction that musicians must engage in chimes with current enactive approaches to cognition. The paper concludes by discussing the role of music research in the development of embodied theories of cognition, suggesting that empirical research into music as social interaction could provide important insights for an enactive understanding of human cognition.

Embodied and enactive cognition studies emphasise the inter-related roles of environment and the body in shaping mental process and experience (Varela, Thompson and Rosch, 1991). A substantial body of contemporary music scholarship takes a broadly embodied approach to cognition, accepting and demonstrating the importance of the corporeal human to the event of music-making. As physical movement is increasingly recognised as central to the perspective and process of the cognition of the individual musician, there is a corollary for musical communication: from this *social* perspective, the immediacy and relevance of others' bodies in relation to oneself becomes paramount. Advocates of the enactive approach to cognition, De Jaegher and Di Paolo (2007) theorise that social interaction is driven by 'participatory sense-making' – the moment-by-moment processes of engagement by which two or more individuals co-construct communicative events in the world.

The potential that such an enactive approach may offer for the study of music is most exciting. Taken at a pragmatic level, the experience of live performance reveals that musicians need to be especially good at facilitating shared, social action. In any performance situation – particularly improvised music – performers must hold open multiple possibilities for ‘next steps’ in a scenario, dependent upon what has just gone before and in anticipation of what may happen next. Musicians in performance react and adjust in real-time to very subtle modulations created by others (and also their own actions); indeed, the expressive nature of ensemble musical performance is contingent upon this being so.

This paper draws on original ethnographic research comprising participant-observer methods for collecting and examining qualitative data. Drawn from this larger study, the current piece of research was based on a selection of semi-structured interviews with North Indian classical musicians, analysed using grounded theory. The study presented in this paper investigates how these musicians conceive of communication in performance, in order to establish appropriate terms for future observational analysis of musician interaction in the genre of North Indian classical music. The main body of this article presents these findings, which resonate with the concerns of advocates of enactive approaches to cognition, as the interviewed musicians suggest that certain embodied and emergent factors of their co-performance (such as social rapport and responsiveness to one another) contribute to the success of the musical interaction. In other words, the process of musical communication they report on appears to consist in events of meaning-through-interaction.

Following a description of the broad research area and musical topic, this article sets out practical details of the data collection and method of qualitative analysis, before detailing the findings in the form of themes and categories found in the interview data. The results of this reflexive process of qualitative analysis are drawn together and presented as a theoretical

‘scaffold’ for future observational work, addressing an important question for such empirical studies: on which aspects of musician movement should observational research focus?

Ethnographic findings on the importance of movement cues related to social rapport and interpersonal responsiveness highlight the need for a social approach to the empirical study of musical communication.

### Defining the research area

A growing number of musicological studies now attend to the performed aspects of music since the ‘landmark studies’ (Clarke & Cook, 2004) of Repp (1990), Davidson (1993) and Rink (1995). New research is now progressing a-pace, using novel research methods facilitated by the availability of high-quality, multi-perspective visual analysis in dedicated laboratories – illustrated, for example, in the work of Keller and Appel (2010); Leman and Naveda (2010); and Luck, Toiviainen and Thompson (2010). The majority of the excellent research in this field has proceeded by reaching further into the analysis of an existing range of topics, such as expressive performance (Camurri, Lagerlöf, & Volpe, 2003; Camurri, Volpe, De Poli, & Leman, 2005; Dahl & Friberg, 2007); and pedagogy (Chaffin, Imreh, & Crawford, 2002; Ginsborg, Chaffin, & Nicholson, 2004), within traditions of Western – typically classical – music.

But a more pragmatic approach to musical meaning demands a different focus of analysis from that available through the study of music as (notated) musical *work*. Among others – particularly those in the field of music education and creativity research (Saywer, 2003) – Keil has discussed at length how improvised (or semi-improvised) musical *process* rather than *product* may be most revealing of the collaborative behaviour of musicians (Keil, 1995). As a focus for this research, North Indian classical music performance is a suitable domain of study because it has both well-formed, culturally-specific constraints in factors of

performance organisation – which provide practical limits for the study – and it also has spontaneity in improvised interaction. The scope of this paper is limited to North Indian duo performance, as performed by an instrumental soloist and tabla accompaniment. (See Clayton (2005) for further discussion of the value of North Indian classical music to studies of musical communication.)

There are certain striking features of North Indian classical music which lend themselves to a discussion of the embodied aspects of live performance. The following section presents some of these, serving two purposes. Firstly, to provide a gloss for readers who are not acquainted with classical Indian music; and secondly, the section establishes the author's participant-observer status as a student of North Indian classical music, validating a degree of 'theoretical sensitivity' (Glaser & Strauss, 1967, p. 46) to the qualitative data analysis that follows.

### *North Indian music performance*

As North Indian classical music is not read or learnt from a score, every *rag* performance develops in a unique fashion. North Indian rag music is not performed from notation, but learnt and transmitted as an oral tradition. The musical pitch system uses a form of solfège, called *sargam*, in which the tonic pitch is named, *Sa*. In comparison to the familiar Western concept that a tone with a frequency of 440 Hz represents the note known as 'Concert A', *Sa* has no fixed pitch. Between one *Sa* and its corresponding octave-equivalent *Sa*, lie the notes *Re*, *Ga*, *Ma*, *Pa*, *Dha*, and *Ni*, which together form a heptatonic set that could be represented by a C major scale. Certain of the notes may also be sharpened or flattened, giving a total of twelve different pitch classes.

Many rags contain more than one version of these variable notes, and the degree to which they are sharpened or flattened is an aesthetic value that varies depending on the rag. Other

factors that are subject to change and serve to define a particular rag include the melodic shape of ascending and descending patterns; characteristic motifs; approaches to certain notes (for example, always from the note above); and the perceived dominance of certain notes over others.

Therefore, despite some similarities to the twelve chroma of the Western classical system, a tonic-dominant hierarchy cannot be applied consistently to Indian music. In particular rags (for example, Rag *Bageshree*) the fourth degree of the scale, Ma, is melodically more salient than the fifth, Pa. In other rags (such as Rag *Marwa*), Pa – the fifth degree – is excluded altogether. Melodic features such as these distinguish different rags; and it is also by these distinctions and subtleties that performers may invoke *ras*. Ras can be described as an experience, emotion, or feeling engendered in both the performers and the listeners; this aesthetic construct also partly defines the concept of rag. The evocation of ras is the jointly-observed goal of all participants in a musical event; in this way, the ‘rules’ of any given rag provide a common basis for social interaction as well as for musical structure.

After the melodic content, a second important source of organization in North Indian music performance is *tal*, the rhythmic structure that can be used to frame the performance of a rag. Many North Indian classical performances are accompanied by a pair of tuned hand-drums, *tabla*. The tabla player provides the foundation of tal through rhythmic patterns based on combinations of *bol* sounds; these can be interpreted as another form of solfège which uses specific syllables to describe individual sound elements. Combinations of these syllables in particular sequences can produce a particular *theke* - a basic rhythmic framework which may represent and deliver a particular time cycle. Theke and tal, therefore, provide another jointly-observed basis for musician (and audience) interaction.

The role of a tabla player is most significant during an instrumental recital, where the percussionist is expected to complement the melodic and rhythmic performance of the instrumentalist, extemporising and improvising beyond the basic *theka*. The interaction between the tabla and sitar player can be a source of excitement in itself: for example, the percussionist might imitate the rhythmic patterns created by the melodic performer; or after a jointly improvised phrase, the two artists may synchronize their approach as they return to beat one of the cycle, known as the *sam*. A typical audience will be acutely aware of the *sam*'s function as a means of social and structural unison (or potential dischord!).

An instrumental duo concert of sitar and tabla typically includes an introductory *alap* section, performed by the melody instrumentalist, during which there should be no regular discernable pulse to the music. The pulse is introduced by the melody instrumentalist in the *jor* section, after which stage the tabla player will usually enter and begin to accompany the melody instrumentalist in the *gat* section. The *gat* is a three or four-phrase pre-composed melody whose phrases are developed by improvised permutations and variations within the boundaries of the rag's melodic, rhythmic and aesthetic framework. The *gat* flows into the *jhala* section; the tempo has usually increased by this stage of performance. The sitarist improvises with the rhythmic aspects of the *tal* most during this final section, using the instrument's *chikari* strings (tuned to a drone, and not used for melody playing) for a combined melodic and percussive effect.

Performances commence with a ritual of tuning (and retuning); the audience will notice a dignified acknowledgement by the musicians of one another, and of their audience – specifically of any eminent musicians who are present – with a directed gaze and nod. Before beginning to play, performing musicians seek consent from experienced performers who may be attending as audience members. While musical performance occasions of all genres are

charged with their own liminal thrall, the sense of shared experience of the musicians and audience in this particular form is a distinguishing feature.

In contrast to the scenario of an orchestral concert, a musician's presence is not obscured by the obstacle of music stand and paper score. While performers at a large auditorium might require low microphone stands for amplification, the physical arrangement for a smaller, less formal event would typically leave nothing but a few feet of air between the seated performer and seated audience. In both auditorium and informal performances, musicians often take great care over the arrangement of their dress, and appear with graceful stage presence; it is right that an audience should be looking at them and valuing their physical presence as an aspect of the performance.

Emphasised by the apparent significance granted by performers for the inter-performer and performer-audience relations, the socially-embedded quality of the musical interaction is apparent even to an uninitiated audience member. The performance moves from an initial unaccompanied introduction, revealing the contours of a rag, to the presentation of melodic and rhythmic components of a composition which, elaborated by the extemporising duet, leads to a climactic period of sitarist and tabla-player virtuosity. The notion of spontaneity and effective, real-time communication between performers – and performers with audiences – is characteristic of the genre.

### *Qualitative data collection and analysis*

The following section sets out practical details of the qualitative data collection and method of analysis. As described below, the reflexive process of qualitative data analysis offers a mode of enquiry that is sensitive to the dynamic social processes that accompany music performance; the results that it yields present aspects of the performers' own perspectives on musical communication.



The corpus from which the data presented in this paper are drawn was collected as part of a doctoral research project. This project used a broad, mixed data collection method that included various techniques of participant-observation, through informal and formal interviewing; and video, audio and journal recordings of study with North Indian musicians<sup>1</sup>. This paper reports on findings uncovered through semi-structured interviews between the author and respondents, based on open questions about the musicians' interpersonal relationships, and their perception of similarity and difference between social and musical interaction. For example, topics included: *What makes a good pairing of soloist and accompanist? What motivates improvised musical performance?* Some of the semi-structured interviews took place in the context of ongoing discussions over a period of weeks or months, reflecting the author's position as a continuing sitar student.

Conducted as part of the doctoral research project, the qualitative data analysis was required to provide grounding for subsequent analysis of the actual event of musical performance using video observation methods (AUTHOR, forthcoming; AUTHOR, 2010). Such an empirical, observational study must be fitted to features of the musical interaction that are demonstrably relevant to North Indian classical musicians. The qualitative analysis, then, aimed to establish relevant categories for the study of musician communication this particular form of musical performance.

One method of qualitative analysis is Grounded Theory, originally devised by Strauss and Glaser (1967), further developed in Strauss and Corbin (1990, 1997). This method is based on a systematic and reflexive coding process to establish certain themes represented in the material. The labelling of these themes helps to develop a suitable theoretical framework for the phenomena in question. In this approach, the emerging theory should not just fit

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<sup>1</sup> The interviews and recordings carried out for this project were made with the assistance and collaboration of Prof. Martin Clayton and Dr Laura Leante. See appendix for details of the interviews.

substantive data, but it should also be generalisable across contexts (Glaser & Strauss, 1967, p. 51). The researcher asks whether the themes drawn out in the process of the analysis can apply in other relevant circumstances for the participants. So, in this case: does the analysis regarding the ways that the musicians communicate and interact hold explanatory power across different performance contexts?

The subsequent stage in the development of a grounded theory therefore requires the grounding of codes with reference to real circumstances – a process that Strauss and Corbin define as ‘axial coding’ (Strauss & Corbin, 1990, pp. 96-115). This method of analysis can be carried out according to a ‘basic frame of generic relationships’ (Borgatti, 2005), so that categories found in the qualitative data can be examined with emphasis on their causal relationships in light of the phenomenon in question.

These stages of analytical coding and comparison are described below, presenting a flavour of the process alongside the arising analytical categories themselves.

### *Open Coding*

The qualitative analysis begins with a process described as *open coding*, ‘a procedure by which the data is first conceptualized. A transcribed text can be analyzed in this way, through examining minutely every line, sentence, or paragraph’ (Strauss & Corbin, 1997, p. 144). The researcher may then compare these conceptual labels with one another, in order to generate a list of conceptual categories from this process (Glaser & Strauss, 1967, p. 106).

During the first stage of the process in this particular research, themes were developed in order to label instances of participants’ reference to particular concepts. Five themes were proposed which could usefully categorise the majority of the text. These initial five themes included:

1. The source of creativity in musical performance
2. Musicians' social roles and responsibilities
3. Ideal musical partnerships for performers
4. Reference to participant's own education, individual development and musician-family (*gharana*) identity
5. Statements pertaining to the distinguishing nature of Indian music versus Western music, or one *gharana* versus another.

The first, number four in the list above, appeared to relate to the interviewee's method of establishing an authentic voice as a spokesperson for their profession as a North Indian classical musician. In this way, the theme correlated with the culturally-specific rhetoric that is used to support the *gharana* system, a notion made explicit in Neuman's account of music and musicians in North India (1980). The fifth theme was a topic that occurred in the context of discussions about the author's status as a visitor from the UK. Since these themes did not pertain to the pragmatic event of musical communication in performance, they were not included in further analysis.

#### *Using the initial themes to interrogate the data*

*BM: ...the artist is there - he's the person responsible for creating the beauty, which is expected of him. But give him a chance! So for the first ten or fifteen minutes, it is the audience's most respectful duty to support the artist in whatever he's doing. If he can't grab the attention of the audience in those fifteen minutes initially, then they're free to talk or leave the place!*

Interview 5, with Budhaditya Mukherjee

In the interview transcript example above, Mukherjee shares his personal understanding of what it is to perform improvised sitar music. The scenario of formal musical performance that

Mukherjee describes is a highly social one. It hinges on his presence as the source of novel, beautiful and creative meaning. He cannot conceive of musical performance without an audience, and his audience must ideally be offering him their full attention. The notion of *rapport*, from social interaction research, provides good purchase here. Rapport is necessary for the creation of a ‘focused and cohesive interaction’ (Tickle-Degnen & Rosenthal, 1990, p. 286); such mutual attentiveness plays a key role in the maintenance of good quality communicative relationships. For Mukherjee, the elements of musical structure which give a performance meaning issue from him alone - but the meaning must also rely on a two-way interaction: his voice cannot simply be heard, it must also be appreciated.

In the qualitative data, social relationship terms such as ‘love’ and ‘affection’ are recurrent terms in musicians’ descriptions of idealised accompanist-soloist musical relationships. It seems that in order that the quality of rapport can be created and sustained, there is a need for visible evidence of positive affect between individuals in interaction. The participants must somehow experience something akin to ‘mutual friendliness and caring’ towards one another - qualities which are typically generated through non-verbal means (Tickle-Degnen & Rosenthal, 1990, p. 286).

In another interview, Manna and Nayak commented on Mukherjee’s quote. Both musicians agreed that there must be affectionate feelings present in some way. Tarun responded with a metaphor:

*TN: That is the accompaniment, when he’s telling me some story I’m telling him some story, we are exchanging our deepest part of our hearts which is very abstract but very concentrated.*

Interview 6, with Subrata Manna and Tarun Nayak

For Nayak then, the musical event is conducted through committed inter-personal exchange.

Parikh's reference to his preferred tabla player was also couched in affectionate terms, and hinted at the source of the connection between a good social relationship and a good accompanist:

*AP: So he started with such a beautiful introduction which was in one to two tempo, and it gave a tremendous pleasure because it's -- .... Because if the tabla player's musical enough, he's able to decipher and absorb what the musician's musical thinking at that particular moment is.*

Interview 3, with Arvind Parikh

Parikh breaks off to consider the components of the high aesthetic value of the tabla player's first entry as accompanist; he pauses, and concludes that the value depends on an accompanist's act of sympathetic communication.

Soloists express strong preferences for one accompanist over another. Indeed, musicians in all genres tend towards certain partnerships and not others. Musicians who do not get on socially can find affinity during co-performance, and the reverse can also be true. Given this, the use of social relationship terms to describe qualities of an ideal musical partnership is interesting. To Parikh, the best accompanist provided a particular density of musical sounds in accompaniment that demonstrated an understanding of Parikh's own intentions – a sympathetic accompanist. Nayak also offered the idea that musical partnerships require a great deal of empathy and mutual knowledge:

*TN: What he thinks [...] that is expressed somewhere or other through music. There must be some common point between two individuals that we can converse.*

Interview 6, with Subrata Manna and Tarun Nayak

The analysis so far suggests that musicians seek sympathetic knowledge of – and perhaps control over – one another's actions when they perform together. The final cycle of the open coding process, then, looked to establish *conceptual categories* that bridged the initial

themes. In the case of these interview transcripts, such categories might reveal something about the practical mechanisms by which the musicians seek to ‘read’ and to influence one another in performance.

### *Conceptual Categories*

Three such categories can be seen in the data, articulating features of the musicians’ expressed opinions about the active way in which performers communicatively engage with one another. The list includes: 1. Negotiated tempo; 2. Musical structure; and, 3. Anticipation of others’ intentions.

Firstly, ‘negotiated tempo’ – a musical pace that is negotiated by both of the performers nonverbally during co-performance. Regarding inter-performer relationships, tempo can reveal what one of the musicians described as either a ‘fit’ or a ‘mismatch’ between performers (Interview 3, with Arvind Parikh). Tempo was also noted for its importance to expressivity in musical performance. Playing ‘in time’ (and in ‘the right’ time) provides the first level of purchase for musicians’ sympathetic co-performance.

The second category described the musicians’ reliance on predetermined aspects of musical structure. The musical structures must be known explicitly by the musicians involved in the interaction. Tarun Nayak gave an interview immediately following a performance with an unfamiliar musician: ‘...so we started with *vilambit* Teental. We know the basic structure, that framework is always there.’ Musicians may navigate their interactions using these structures, and within this framework they have an opportunity to seek out the underlying intentions of other musicians – Budhaditya Mukherjee suggested that ‘if my *sangatkar* [accompanist] is enjoying the music as well as giving me the *sangat* [accompaniment], he will realise that this is not the time to play his solo part.’

This leads to the final category proposed here, of ‘anticipation of others’ intentions’. The labelling of this category refers to the presence of musicians’ awareness of both their anticipation of others’ intentions, and their desire to be understood in this way themselves. In pragmatic terms, the musicians may try to predict what Parikh described as an ‘expected kind of moment’. They may do this with regards a musical structure developed by or with other musicians, or they may try to read the audience response – Purvi Parikh explained how ‘you can see that is a discerning person... you see people in the audience who you feel are receiving your communication’ (Interview 4 with Purvi Parikh). Acts of relationship-maintenance occur not only between performers, but also between performers and audience members. Themes in the data pointed to the musicians’ own view of music as an act of shared, emergent expression. For example, ‘There is some common point that we feel we’re hitting on both sides. That is always happening with him and me also when we’re playing.’ (Interview 6, with Subrata Manna and Tarun Nayak.)

#### *Reflecting on the context of musical interaction occasions*

Contexts for musical behaviour range from rehearsals to lessons to social occasions to formal performances in concert halls. The theory that emerges from data coding should not just fit substantive data, but should also be generalisable across contexts (Glaser & Strauss, 1967, p. 51). The three proposed conceptual categories suggest mechanisms of communication (‘negotiated tempo’, ‘musical structure’, ‘intention to anticipate’) which sit across the infinite variety of practical situations of music-making; the musicians’ enactment of these proposed conceptual categories would influence the emergent musical interaction in each case.

Musician reports in the ethnographic data demonstrate that the physical co-presence of ‘audience’ groups – formal or otherwise – has an impact on musical performance. For example, Mukherjee’s performance is affected by audience presence (‘If [a listener’s

distraction were to] reach the stage, then this will kill the artist's thought process'), while just one receptive listener may transform the whole experience for the performer, from a state of feeling distanced and formal, to an experience closer to that of an informal concert – according to Purvi, '[if] you can see *that* is a discerning person, you are almost addressing your entire concert to that person.' (Interview 4, with Purvi Parikh.) In this sense, dynamic relationship maintenance – as opposed to external circumstance – is a key element that defines distinct contexts of musical event.

Strauss and Corbin emphasise the need to focus analytically on the dynamic features of a research topic, to observe the shifting aspects of the social phenomenon (1990, pp. 96-115). In the case of musical interaction, their approach can be used to concentrate the study on those emergent mechanisms of communicative process which might underpin the event. As stated earlier, the development of a grounded theory requires the grounding of codes with reference to real circumstances, so that categories found in the qualitative data can be examined with emphasis on their causal relationships in light of the phenomenon in question. Every rag performance develops in a unique fashion; every event of musical performance is different. The dynamics of a musical interaction can be defined as the qualities of performance that contribute to the musicians' own view and understanding of the event, including their relationships within it. Table 1 provides the outline of a generic framework for complex social phenomena (Borgatti, 1996), and shows an adaptation for the case of communicative musical interaction.

[TABLE 1 HERE]

The qualitative data analysis points to *action strategies* in the nonverbal behaviour arising from physical co-presence in musical events. In particular, a range of communicative, co-ordinated, other-aware behaviours associated with relationship maintenance seem to be key



contributors to the dynamics of the interaction – for example, movement cues related to attention-giving and attention-receiving behaviours associated with social rapport and responsiveness. The *moderating variables* influencing the event of communicative musical interaction include the various circumstances in which the musical interaction takes place, such as informal and pre-concert rehearsals, lessons, conversations, formal concerts or informal performances. *Intervening* conditions affecting the musical interaction include the presence of other people who witness the interaction, and the social roles of these people.

The interview material suggests that North Indian musicians' relationships with one another – relationships made manifest during live performance, where the musical interaction is negotiated and maintained – are of paramount importance to successful performance. In pragmatic terms, the interaction is constrained by aspects of what could be described as the socio-musical context: the enacted components of musical structure and social co-presence that house the relationships required for musical communication.

### Conclusions

The account of musical communication arising in this ethnography offers strong foundations for empirical studies of musician communication that address 'music' as an event of interaction. When this phenomenon is considered in the light of the framework in Table 1, various components lend themselves as independent variables to structure observational analysis. For the promising results of an exploratory observational study based on these terms, see AUTHOR (2007; forthcoming). This study, which focused on movement cues including the ostensive attention patterns of the duo musicians, and the occurrence and timing of the expressive gestures of their upper torsos, compared musician behaviour across varied performance and social contexts. An example from this study's findings includes the observation that musicians' ostensive attention patterns varied significantly according to their

role in the duo, and the context of their performance. Furthermore, musicians appeared to use responsive upper torso gestures to acknowledge the attentive gaze of their partner – a finely-timed and co-ordinated mechanism to support joint musical performance. By ‘uttering’ vocal or bodily responses that contribute to the musical performance event, musicians’ behaviours seem comparable to the work of ‘back channelling’ in everyday conversation whereby listeners play a role in the creation and maintenance of dialogue through their non-verbal vocal and gestural utterances (Bavelas, Coates, & Johnson, 2002; Clark, 1996; Goodwin, 1981). When applied to performance, this account of communication emphasises the importance of musicians’ socially-responsive movement cues, supporting further the case for a deeply social and embodied paradigm for music cognition research.

In the analysis presented in this paper, the performer and audience’s nonverbal demonstration of their attention to one another is a key factor of successful, meaningful performance. The action strategies applied by the musicians in the service of co-performance include richly communicative behaviours that allow them to demonstrate other-awareness and to co-ordinate their participation without conversation. This finding draws attention to the moment-by-moment process that performing musicians must undertake in co-constructing the musical interaction event; it emphasises the emergent quality of meaning-through-interaction given rise in enactive approaches to cognition. There are precedents for methods of empirical research into such communicative movement-in-time in the wide, multidisciplinary field of social interaction research outside of music scholarship. This includes, for example, nonverbal communication studies from Kendon (1981, 2005) to Bavelas (2007); research from computing and robotics that tackles issues such as social signal processing (Vinciarelli, Pantic and Bourland, 2009); and experimental simulations of minimal, social interactions (Auvray, Lenay and Stewart (2009).

By focusing on the responsive movement cues by which musicians may mediate their 'online' relationship with one another, new empirical studies could begin to respond to the important challenges presented in Cross' (2008) functional account of the experience of musical meaning. Outside of contemporary western culture, Cross notes that 'we find music performing a multiplicity of roles, often in the form of dynamic interaction. Music is not simply something that is heard and consumed, it is something that is done in interaction with others' (Cross, 2008, p.151) – a perspective that is compatible with De Jaegher and Di Paolo's (2007) enactive account of social interaction as 'participatory sense-making'. According to Cross, the experience of music's meaning manifests at least three aspects: the features of our experience of sound (and gesture) that are shared with other species; those that are specific to human interaction and that lie beneath our capacity for cultural interaction; and finally, a dimension that derives from the specificities of cultural contexts in which humans develop and participate (2008, p.155). Empirical work that develops the analysis of musical performance along enactive and social lines of enquiry would both emphasise the role of inter-musician relationships, and also contextualise the interaction function of music performance within its cultural dimension.

In the case of music, the cognition of the isolated individual can clearly tell only a fraction of the story. The study of musical meaning is likely to require much attention not only to human bodies but their relation to one another. As an alternative to the individualistic emphasis of much cognition research (on perception, recognition and identification processes, for example), broadly embodied approaches have much to offer music studies. The next challenge is to imagine, theorise and explore ways that individual-level process and cognition might articulate with layers of social and cultural knowledge. This requires more than a

general acknowledgement of the body, but an approach that consistently and specifically values the *social* perspective of human music making<sup>2</sup>.

While an enactive account of social interaction as described in De Jaegher and Di Paolo (2007) may help to stimulate new ways to conceive of music in daily life, the ultimate utility of enactive approaches to cognition depends upon genuinely interdisciplinary support. Philosophically-derived theoretical frameworks offer clarity of argument and nuances of definition; experimental methodologies provide empirical observations and quantification; computational modelling furthers the research community's understanding of theoretical proposals; and the potential applications of new knowledge about human communication may ultimately be available through clinical trials and practice. However, all of these elements need grounding in studies of real, social phenomena. Musicians embody culturally-specific, mature knowledge – both intellectual and physical – of the forms and structures that make their music meaningful. In the event of performance, the music they make is emergent; in experience, musical events constitute something of greater meaning than the sum of the contributing individual musicians' behaviours. In return for the light that enactive approaches may shed on the phenomenon of musical communication, the study of music *as* social interaction may have an important role in the development of novel theories of truly social cognition.

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<sup>2</sup> An example of this perspective is shown in the work of Kirschner and Tomasello (2010).

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## Appendix: Details of Interviews

[TABLE 2 HERE]